

Polychaete Fauna of the Boso Peninsula Coasts, with An Appendix on Polychaete Type Specimens deposited in Chiba Prefectural Museums

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Abstract Over 160 species of polychaete species belonging to 37 families have been previously reported from the Boso Peninsula coasts. Here, we added some new records based on exact specimens collected around Boso Peninsula. In each habitat, 50 species are reported around intertidal to subtidal sandy-muddy bottoms, 12 species from estuarine mud flats, 12 species from sandy shores, over 60 species from rocky shores, and approximately 30 species from gill-net samples collected in Tokyo Bay. Out of these species, 9 species are known as pollution-indicator species, 7 are introduced species, and 3 are considered to be endangered. We review here polychaete composition and diversity in various habitats around Boso Peninsula. Furthermore, we provide a list of type specimens deposited in Natural History Museum and Institute, Chiba and its Coastal Branch, total of 43 lots of types.

Boso Peninsula located at south-eastern part of Kanto area is washed by the waters of Tokyo Bay and the Pacific Ocean Sea (Sotobo and Kujukuri), and has nearly 535 kilometers of coastline. It has diverse habitats including estuarine mudflats, rocky and sandy shores, seagrass meadows, deep sea down to excess of 1000 m. We summarize here the polychaete species reported from the Boso Peninsula up to now.

Many studies have reported benthic fauna from Tokyo Bay and around the Boso Peninsula (e. g., Furota and Sato-Okoshi, 1997), but polychaetes are usually difficult to identify to the specific level because of their small body size and poorly understood taxonomy. Thus, in order to determine correct polychaete faunal composition, all questionable identifications should be revised and corrected. Many of the original identifications and designations have been modified or revised by recent workers (e.g., Imajima, 1996, 2001, 2007; Sato-Okoshi, 1999, 2000; Yokoyama, 2007; Nishi *et al.*, 2007b; Yamanishi and Sato, 2007) and every attempt has been made to include all synonymies and nomenclatural changes in the list. Some of the recent material collected around the Boso Peninsula was re-examined and necessary corrections were made when

possible.

Polychaetes tend to respond to quickly to environmental changes and some species occur at higher densities in polluted environment, such as organically enriched sediments and chemically polluted areas (e.g., Pearson and Rosenberg, 1978; Diaz and Rosenberg, 1995). Therefore, polychaetes can serve as indicators of the condition of the inhabited sediments and thus, may be important in monitoring quality of marine environments. Nishi *et al.* (2009a) listed 8 pollution indicator species among the Tokyo Bay polychaetes. Here, we also noted the availability of those indicator species for monitoring of environmental changes around the peninsula coastal environments.

A number of endangered polychaete species inhabit Japanese waters. Some of these polychaetes have been recorded from the non-marine environments, such as freshwater rivers, lakes and subterranean waters of caves (Glasby *et al.*, 2009). Considering the restricted and sensitive nature of these habitats, many taxa are likely to be vulnerable to human impacts (Glasby *et al.*, 2009). In Japan the most commonly cited endangered taxa are polychaetes from freshwater caves, such as undescribed species of Nerillidae from Akka Cave,

Kitakami, from Akiyoshidai Cave, Yamaguchi, and from Ishigaki-jima Island, Okinawa (Ueno, 1965, 1973). Some estuarine brackish water species have threatened status because the environments they inhabit have been currently heavily impacted by human activities. According to Yamanishi (1996), *Mesochaetopterus japonicus* Fujiwara, 1934 should be considered endangered, and *Chaetopterus cautus* Marenzeller, 1879 may deserve the threatened status as well. Nishi (2002) stated that *C. cautus* found in intertidal to subtidal mud flats is also threatened. We report here the species having the threatened status in Boso Peninsula.

Many serious problems of marine and coastal environments caused by alien and introduced species were recently intensified (Ecological Society of Japan, 2002). As a result, the introduced species have been common targets of ecological studies (JWRC, 2008). Alien species introduced to new distant habitats can multiply uncontrollably, sometimes with devastating effects on marine biodiversity and human economy (e.g., Plankton Society of Japan and Japanese Association of Benthology, 2009). Polychaetes are commonly found as alien species or pests (e.g., Nishi and Kato, 2004, Link *et al.*, 2009) and pest worms are reported to cause severe damages (e.g., Iwasaki *et al.*, 2004). We shortly report here notable introduced species found in the waters around Boso Peninsula.

We also included a list of the type specimens deposited in the collections of the Natural History Museum and Institute, Chiba (CBM) and its Coastal Branch (CMNH) given in “Appendix”. Those type specimens are not only from Boso Peninsula and Japanese coasts, but also from localities world-wide.

Materials and Methods

Earlier literature (e.g., Imajima and Hartman, 1964; Izuka, 1912) contains some records of polychaetes from Boso Peninsula. Here they are listed under their currently recognized taxonomic names. A number of environmental assessment reports mentioned fauna of tidal flats in the inner side of Tokyo Bay (e.g., Nishi *et al.*, 2009b). We first summarize them and correct some misidentifications. We re-examined yet uncatalogued polychaete material collected by CMNH as a by-catch from gill-net samples taken off Uchibo, the southern part of Tokyo Bay (off Kanaya, 75–320 m deep, 15 November 1995), and the eastern part of the Peninsula (Tateyama to Choshi, 1994 to 2000). This material will be deposited in CMNH. A preliminary list of

the polychaete fauna around Katsuura was reported by the Board of Education, Chiba Prefecture (Chiba Prefecture, 1995). Some of those samples catalogued in CMNH were re-examined by us. Additionally, the first author has collected many polychaetes around Boso Peninsula in 2005–2009. We re-examined those samples and listed here some species as catalogued or non-catalogued specimens. Non-catalogued specimens will be deposited in CMNH in the near future. We added here the records of Uchida and Hirano (1996) and Uchida (2000) from Kominato area and Boso Peninsula, respectively. The rocky shore samples come from Choshi, Tateyama and Katsuura and the sandy shore samples are from Kujukuri. The fouling community samples are from Choshi, Katsuura and Funabashi. The tidal flat samples from Tokyo Bay were analyzed by Masumoto *et al.* (2007a, b). In addition to re-examining these samples, we also summarize the published records of polychaetes, including planktonic and deep sea ones.

The following taxonomic publications were used to identify polychaetes of the Boso Peninsula area: Hesionidae – Pleijel, 1998, Uchida, 2004, Pleijel and Rouse, 2005; Goniadidae – Böggemann, 2005; Glyceridae – Böggemann, 2002, Böggemann and Fiege, 2001; Phyllodocidae – Kato and Pleijel, 2002, 2003, Kato *et al.*, 2001; Pilargiidae – Nishi *et al.*, 2007b, Licher and Westheide, 1997, Imajima, 1987, Salazar-Vallejo and Harris, 2006, Salazar-Vallejo, 1987; Nereididae – Glasby and Hsieh, 2006, Wu *et al.*, 1985, Sato and Nakashima, 2003; Eunicidae – Hutchings and Karageorgopoulos, 2003, Fauchald, 1992, Miura, 1977, 1986; Onuphidae – Paxton, 1998, 2002; Spionidae – Sato-Okoshi, 1999, 2000, Yokoyama, 2007; Magelonidae – Kitamori, 1967; Capitellidae – Green, 2002, Ewing, 1982, Warren *et al.*, 1994; Ophelidae – Saito *et al.*, 2000; Sabellariidae – Kirtley, 1994; Oweniidae – Koh and Bhaud, 2003, Imajima and Morita, 1987; Terebellidae – Nishi and Tanaka, 2006, Hilbig, 2000, Imajima and Hartman, 1964; Sabellidae – Fitzhugh, 1989, Knight-Jones and Perkins, 1998, Tovar-Hernandez, 2007a, b, Nishi *et al.*, 2009; Serpulidae – Fiege and ten Hove, 1999, Nishi, 1999, 2003, Nishi *et al.*, 2007a, Link *et al.*, 2009.

The following list presents a summary of polychaetes identified to the specific level by the taxonomic experts and recorded in the academic literature. Family and genera lists are arranged alphabetically. Although a good selection of literature was available during the

Dorvilleodae

Iphitime dodderleinii Marenzeller, 1902

Kominato, gill-net sample, uncatalogued, collected from the branchial cavity of *Macrocheira kaempferi* (Temminck)

Schistomeringos japonicus (Annenkova, 1937)

Kominato, shallow water – Uchida and Hirano, 1996.
Boso Peninsula, shallow water – Uchida, 2000.

Eunicidae

Eunice afra Peters, 1854

Katsuura, shallow water – uncatalogued, 1995–1996.

Eunice aphroditois (Pallas, 1788)

Boso Peninsula, intertidal to shallow water, rocky shore – Uchida, 2000.

Eunice antennata (Savigny in Lamarck, 1818)

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Eunice congesta Marenzeller, 1879

Kominato, intertidal to shallow water – Uchida and Hirano, 1996.

Eunice indica Kinberg, 1865

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Eunice tentaculata Quatrefages, 1865

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Lysidice collaris Grube, 1868

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Boso Peninsula, intertidal to subtidal water – Uchida, 2000.

Marphysa sanguinea (Montagu, 1815)

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Sanbanse, tidal flat – Masumoto *et al.*, 2007b.

Palola siciliensis (Grube, 1840)

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Boso Peninsula, rocky shore – Uchida, 2000.

Euphrosinidae

Euphrosine superba Marenzeller, 1879

Kominato – Izuka, 1912; Imajima and Hartman 1964.

Goniadidae

Glycinde wireni Arwidsson, 1899

Sanbanse, tidal flat – Masumoto *et al.*, 2007b.

Glyceridae

Glyceria alba (O. F. Müller, 1776)

Sanbanse, sandy tidal flat – Böggemann, 2002.

Glyceria subaenea Grube, 1878

Boso Peninsula, sandy shore to sandy mud – Uchida, 2000.

Remarks. – It is possibly a synonym *Glyceria macintoshi* Grube, 1877 (Yamanishi and Sato, 2007).

Glyceria nicobarica Grube, 1868

Choshi, sandy mud – Böggemann, 2002.

Sanbanse, mud flat – Böggemann, 2002.

Sanbanse, tidal flat – Masumoto *et al.*, 2007b.

Glyceria macintoshi Grube, 1877

Katsuura, 15–20 m, sandy bottom – Böggemann, 2002.

Tateyama, subtidal muddy bottom – Böggemann, 2002.

Futtsu Cape, subtidal sandy bottom – Böggemann, 2002.

Sanbanse and Nii-hamako, tidal flat – Böggemann, 2002.

Sanbanse and Nii-hamako, tidal flat – Masumoto *et al.*, 2007b.

Glyceria onomichiensis Izuka, 1912

Katsuura, subtidal sandy mud – Böggemann, 2002.

Glyceria pacifica Kinberg, 1865

Katsuura, subtidal, among rubble – Böggemann, 2002.

Hemipodia yenourensis (Izuka, 1912)

Katsuura, 15–20 m, shallow water – Böggemann, 2002.

Hesionidae

Amphidulos setosus (Hessle, 1925)

Katsuura, rocky shore – uncatalogued, 1995–1996.

Leocrates chinensis Kinberg, 1866

Katsuura, uncatalogued, May to June 1996.

Micropoderke dubia (Hessle, 1925)

Katsuura, shallow water – uncatalogued, 1995–1996.

Amphiduros setosus (Hessle, 1925)

Boso Peninsula, shallow water – Uchida, 2000.

Gyptis lobata (Hessle, 1925)

Boso Peninsula, shallow water – Uchida, 2000.

Hesione reticulata Marenzeller, 1879

Boso Peninsula, intertidal to shallow water – Uchida, 2000.

Lumbrineridae

Lumbrineris japonica (Marenzeller, 1879)

literature survey and during an identification of each species, the main impediment to quick and accurate identifications of the fauna of the Boso Peninsula remains the lack of modern taxonomic studies.

Results

List of the polychaetae species found at Boso Peninsula

Acrocirridae

Acrocirrus validus Marenzeller, 1879

Kominato, intertidal to shallow water – Uchida and Hirano, 1996.

Kominato, rocky shore – Uchida, 2000.

Amphictenidae

Lagis bocki (Hessle, 1917)

Katsuura, subtidal sandy shore – uncatalogued, April 1996.

Amphinomidae

Chloeia flava (Pallas, 1766)

Tateyama – Moore, 1903; Imajima and Hartman, 1964.

Pareurythoe japonica Gustafson, 1930

Kominato, shallow water – Uchida and Hirano, 1996.

Arenicolidae

Arenicola brasiliensis Nonato, 1958

Sanbanse and Nii-hamako, tidal flat – Masumoto *et al.*, 2007a.

Abarenicola pacifica Healy and Wells, 1959

Sanbanse, tidal flat, uncatalogued, 1995–2004.

Tateyama, shallow water – Uchida, 2000.

Capitellidae

Capitella capitata species complex

Sanbanse, tidal flat – Masumoto *et al.*, 2007a.

Remarks. Recently *Capitella* sp. I was described as *Capitella teleta* Blake, Grassle and Eckelbarger, 2009, and treated as an opportunistic species (Blake *et al.*, 2009). *Capitella* sp. I is also a pollution indicator commonly recorded in Tokyo Bay (Masumoto *et al.*, 2007a, b). The wide distribution of the species (Europe, the United States, and Japan) and its opportunistic use of shallow-water organically enriched sediments suggests that the species is probably transported in ballast waters and may have been introduced into some areas of world (Blake *et al.*, 2009). It should be checked whether the Japanese

Capitella capitata recorded from organically polluted environments is *C. tereta* or another species.

Dasybranchus caducus (Grube, 1846)

Kominato, shallow water – Uchida and Hirano, 1996.

Heteromastus cf. *similis* Southern, 1921

Sanbanse, tidal flat – Masumoto *et al.*, 2007a.

Leiochrides australis Augener, 1914

Kominato, intertidal to shallow water – Uchida and Hirano, 1996.

Notomastus cf. *latericeus* Sars, 1851

Sanbanse, tidal flat – Masumoto *et al.*, 2007a.

Notomastus variegates Berkeley and Berkeley, 1950

Kominato, shallow water – Uchida and Hirano, 1996.

Chaetopteridae

Chaetopterus cautus Marenzeller, 1879

Tateyama – Izuka, 1912; Imajima and Hartman, 1964.

Sanbanse, tidal flat – Masumoto *et al.*, 2007b.

Tateyama, subtidal sandy bottom – Nishi, 2001a.

Chaetopterus japonicus Nishi, 2001

Tateyama, shallow water, muddy bottom – Nishi, 2001a.

Spiochaetopterus sanbanzensis Nishi, Bhaud and Koh, 2004

Sanbanse and Nii-hamako, tidal flat – Masumoto *et al.*, 2007b.

Chrysopetalidae

Bhawania goodie Webster, 1884

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Boso Peninsula, intertidal to shallow water, rocky shore – Uchida, 2000.

Cirratulidae

Cirratulus cirratulus (O.F. Muller, 1776)

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Boso Peninsula, shallow water – Uchida, 2000.

Cirrifornimia comosa (Marenzeller, 1879)

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Boso Peninsula, intertidal to shallow water – Uchida, 2000.

Sanbanse and Nii-hamako, tidal flat – Masumoto *et al.*, 2007b.

Boso Peninsula, intertidal to shallow water – Uchida, 2000.

Lumbrineris latreilli (Audouin and Milne-Edwards, 1834)

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Scoletoma longifolia (Imajima and Higuchi, 1975)

Sanbanse, tidal flats – uncatalogued, June 2004.

Scoletoma nipponica (Imajima and Higuchi, 1975)

Boso Peninsula, intertidal to shallow mud bottom – Uchida, 2000.

Sanbanse and Nii-hamako, tidal flat – Masumoto *et al.*, 2007a.

Maldanidae

Maldane pigmentata (Imajima and Shiraki, 1982)

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995 (as *Aschis pigmentata*).

Nephtyidae

Nephtys polybranchia Southern, 1921

Sanbanse, tidal flats – Masumoto *et al.*, 2007a.

Nereididae

Ceratonereis hircinicola (Eisig, 1870)

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Ceratonereis erythraeensis Fauvel, 1918

Boso Peninsula, estuarine mud flat – Uchida, 2000.

Sanbanse and Nii-hamako, tidal flat – Masumoto *et al.*, 2007a.

Hediste atoka Sato and Nakashima, 2003

Sanbanse, tidal flats – Masumoto *et al.*, 2007a.

Hediste diadroma Sato and Nakashima, 2003

Sanbanse, tidal flats – Masumoto *et al.*, 2007a.

Neanthes caudate (delle Chiaje, 1828)

Katsuura, intertidal to subtidal, Chiba Prefecture, 1995.

Neanthes succenea (Frey and Leuckart, 1847)

Boso Peninsula, shallow water mud flats – Uchida, 2000.

Sanbanse and Nii-hamako, tidal flats – Masumoto *et al.*, 2007a.

Nectoneanthes latipoda Paik, 1973

Sanbanse, tidal flats – Masumoto *et al.*, 2007a.

Nereis heterocirrata Treadwell, 1931

Takami, near Choshi – Treadwell, 1931; Imajima and

Hartman, 1964.

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Boso Peninsula, intertidal to shallow subtidal, rocky shore – Uchida, 2000.

Nerereis multignatha Imajima and Hartman, 1964

Choshi – Izuka, 1912 (as *Nereis pelagica*).

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Nereis neoneanthes Hartman, 1948

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Nereis pelagica Linnaeus, 1758

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Nereis zonata Malmgren, 1867

Choshi – Izuka, 1912.

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Perinereis cultrifera (Grube, 1840)

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Boso Peninsula, intertidal to shallow water, rocky shore – Uchida, 2000.

Platynereis bicanaliculata (Baird, 1863)

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Kominato, shallow water – Uchida and Hirano, 1996.

Boso Peninsula, intertidal to shallow water, rocky shore – Uchida, 2000.

Perinereis brevicirris (Grube, 1869)

Tateyama Bay – Izuka, 1912; Imajima and Hartman, 1964.

Pseudonereis variegata (Grube, 1856)

Boso Peninsula, rocky shore – Uchida, 2000.

Tylorrhynchus heterochaetus (Quatrefages, 1865)

Boso Peninsula, estuarine mud flat – Uchida, 2000.

Sanbanse and Nii-hamako, tidal flat – Masumoto *et al.*, 2007a.

Oeonidae

Arabella iricolor (Montagu, 1804)

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Boso Peninsula, shallow water – Uchida, 2000.

Oenoe fulgida (Savigny, 1818)

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Boso Peninsula, rocky shore – Uchida, 2000.

Onuphidae

Diopatra sugokai Izuka, 1907

Boso Peninsula, intertidal to subtidal – Uchida, 2000.

Sanbanse, tidal flat – Masumoto *et al.*, 2007b.

Opheliidae

Armandia lanceolata Willey, 1905

Kominato, shallow water – Uchida and Hirano, 1996.

Boso Peninsula, intertidal to shallow water – Uchida, 2000.

Armandia amakusaensis Saito, Tamaki and Imajima, 2000

Sanbanse, tidal flat – Masumoto *et al.*, 2007a.

Orbiniidae

Naineria laevigata (Grube, 1855)

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Boso Peninsula, intertidal sandy mud – Uchida, 2000.

Oweniidae

Owenia gomsoni Bhaud and Koh, 2001

Sanbanse, tidal flats – Masumoto *et al.*, 2007b.

Pectinariidae

Amphictene japonica Nilsson, 1928

Choshi – Okuda, 1934; Imajima and Hartman 1964.

Lagis bocki Hesse, 1917

Sanbanse, tidal flats – Masumoto *et al.*, 2007b.

Pilargiidae

Sigambra hanaokai (Kitamori, 1967)

Sanbanse, tidal flats – Masumoto *et al.*, 2007a.

Phyllodoceidae

Phyllodoce maculata (Linnaeus, 1767)

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995 (as *Anaitides maculata*)

Eteone cf. *longa* (Fabricius, 1780)

Sanbanse, tidal flats – Masumoto *et al.*, 2007a.

Eulalia viridis (Linnaeus, 1767)

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Katsuura, Tateyama, Funabashi, Sanbanse –

uncatalogued, 2004–2007.

Eumida sanguinea (Oersted, 1943)

Katsuura, intertidal rocky shore – uncatalogued, April 1995.

Nereiphylla castanea (Marenzeller, 1879)

Boso Peninsula, muddy bottoms – Uchida, 2000. (as *Genetyllis castanea*)

Notophyllum japonicum Marenzeller, 1879

Kominato, intertidal rocky shore – Uchida and Hirano, 1996. (as *Nipponophyllum japonicum*)

Kominato, Honshu, intertidal – Kato and Pleijel, 2002.

Phyllodoce japonica Imajima, 1967

Sanbanse and Nii-hamako, tidal flat – Masumoto *et al.*, 2007a.

Pterocirrus macroceros (Grube, 1860)

Boso Peninsula, subtidal water, rocky shore – Uchida, 2000.

Pterocirrus notoensis (Imajima, 1967)

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Polynoidae

Harmothoe imbricata Linnaeus, 1767

Katsuura, intertidal, Nishi – uncatalogued, April, 2005.

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Sanbanse, Shinahamako, tidal flat – Masumoto *et al.*, 2007a.

Harmothoe waahli (Kinberg, 1855)

Kominato, shallow water – Uchida and Hirano, 1996.

Halosydna brevisetosa Kinberg, 1855

Choshi – Izuka, 1912 (as *Polynoe vexilaria*)

Kominato, intertidal to shallow water – Uchida and Hirano, 1996.

Boso Peninsula, intertidal to shallow water, rocky shore – Uchida, 2000.

Lepidasthenia izukai Imajima and Hartman, 1964.

Choshi – Izuka, 1912 (as *Polynoe longissima*).

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Boso Peninsula, intertidal to shallow water, rocky shore – Uchida, 2000.

Lepidonotus carlorus Moore, 1903

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Lepidonotus elongates Marenzeller, 1902

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Lepidonotus yorkianus Augener, 1922

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Boso Peninsula, intertidal to shallow water, rocky shore – Uchida, 2000.

Paralepidonotus ampulliferus (Grube, 1878)

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Boso Peninsula, intertidal rocky shore – Uchida, 2000.

Sabellariidae

Idanthyrsus okudai Kirtley, 1994

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995 (as *I. pennatus*) (see Nishi and Kirtley, 1999).

Sabellaria ishikawai Okuda, 1938

Sanbanse, tidal flat – Masumoto *et al.*, 2007a, b.

Sabellaria isumiensis Nishi, Bailey-Brock, dos Santos and Kupriyanova, 2010

Ubarajima, Katsuura, and Onjuku, Isumi, subtidal rocky shore – Nishi *et al.* 2010

Sabellidae

Bispira wireni (Johansson, 1922)

Off Ukishima, Uchibo, Tokyo Bay, 200–300 m deep – Nishi *et al.*, 2000b.

Laonome albicingillum Hsieh, 1995

Nii-hamako Lake, muddy bottom – Nishi *et al.*, 2005

Megalomma acrophthalmos (Grube, 1878)

Boso Peninsula, shallow water, sandy bottom – Uchida, 2000.

Myxicola infundibulum (Renier, 1804)

Boso Peninsula, intertidal to shallow water – Uchida, 2000.

Pseudopotamilla elegans (Johansson, 1922)

Yokosuka Channel – Johansson, 1922.

Pseudopotamilla ocellata Moore, 1905

Boso Peninsula, intertidal to subtidal, rocky shore – Uchida, 2000.

Sabellasterte japonica (Marenzeller, 1884)

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Boso Peninsula, rocky shore – Uchida, 2000.

Sabellasterte spectabilis (Grube, 1878)

Katsuura and Uchibo, shallow water – Knight-Jones

and Mackie, 2003.

Scalibregumidae

Hyboscolex longiseta Schmarda, 1861

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Serpulidae

Ficopomatus enigmaticus Fauvel, 1923

Boso Peninsula, estuarine shallow water – Nishi, 2003.

Filograna implexa Berkeley, 1851

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Boso Peninsula, intertidal to subtidal, rocky shore – Uchida, 2000.

Hydroides dianthus Verrill, 1873

Nii-hamako Lagoon – Link *et al.*, 2009.

Hydroides elegans Haswell, 1884

Tokyo Bay, estuarine habits – uncatalogued, 2003–2005.

Hydroides ezoensis Okuda, 1934

Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Sanbanse, tidal flat – Masumoto *et al.*, 2007a.

Boso Peninsula, intertidal to subtidal – Uchida, 2000.

Hydroides fusicola Morch, 1863

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Neodexiospira foraminosa (Bush, 1904)

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Protula tubularia (Montagu, 1803)

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Pseudochitinopoma pavementata Nishi, 1999

Off Tateyama, Tokyo Bay, 105–113 m, on shell – Nishi, 1999.

Serpula vittata sensu Imajima, 1979

Kominato, intertidal rocky shore – Uchida and Hirano, 1996.

Spirobranchus (Pomatoleios) kraussii (Baird, 1865)

Boso Peninsula, intertidal rocky shore – Uchida, 2000.

Spirobranchus tetracerus (Schmarda, 1861)

Katsuura, intertidal to subtidal – uncatalogued, April, 1996.

Spirobranchus gaymardi (Quatrefages, 1866)

Tateyama, on coral head – uncatalogued, May to

August 1996, see Fiege and ten Hove, 1999.

Spionidae

- Aonides oxycephala* (Sars, 1862)
Sanbanse, tidal flat – Masumoto *et al.*, 2007a.
- Carazziella reishi* (Woodwick, 1964)
On *Halle* shell, 1–3 m, Chikura, Tateyama, Boso Peninsula – Sato-Okoshi, 1999.
- Dipolydora armata* (Langerhans, 1881)
On *Halle* shell, Chikura, Tateyama, Boso Peninsula – Sato-Okoshi, 1999.
- Paraprionospio patiens* Yokoyama, 2007
Sanbanse, tidal flat – Masumoto *et al.*, 2007a (as *Paraprionospio pinnata* type A).
- Polydora aura* Sato-Okoshi, 1998
Chikura, Tateyama, Boso Peninsula – Sato-Okoshi, 1998.
- Polydora cornuta* Bosc, 1802
Tokyo Bay, shallow water – Sato-Okoshi, 2000.
Sanbanse and Nii-hamako, tidal flat – Masumoto *et al.*, 2007a.
- Polydora websteri* Hartman, 1943
On *Batillus* shell, Chikura, Tateyama, Boso Peninsula – Sato-Okoshi, 1999.
- Prionospio aucklandica* Augener, 1923
Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.
- Prionospio japonica* Okuda, 1935
Sanbanse and Nii-hamako, tidal flats – Masumoto *et al.*, 2007a.
- Prionospio pulchra* Imajima, 1990
Sanbanse, tidal flats – Masumoto *et al.*, 2007a.
- Prionospio variegata* Imajima, 1990
Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.
- Pseudopolydora kempfi* (Southern, 1921)
Tokyo Bay, shallow water – Sato-Okoshi, 2000.
Sanbanse, tidal flats – Masumoto *et al.*, 2007a.
- Rhyncospio glutaea* (Ehlers, 1897)
Sanbanse and Nii-hamako, tidal flats – Masumoto *et al.*, 2007a.
- Scolecipis lingulata* Imajima, 1992
Sanbanse, tidal flats – Masumoto *et al.*, 2007a.
- Scolecipis kudenovi* Hartmann-Schröder, 1981
Sanbanse, tidal flats – Masumoto *et al.*, 2007a.
- Scolecipis texana* Foster, 1971
Sanbanse and Nii-hamako, tidal flat – Masumoto *et al.*, 2007a.
- Spio filicornis* (Muller, 1766)
Katsuura, intertidal to subtidal – Chiba Prefecture,

1995.

- Sanbanse, tidal flats – Masumoto *et al.*, 2007a.
- Spiopahnes bombyx* (Claparede, 1870)
Sanbanse, tidal flats – Masumoto *et al.*, 2007a.
- Streblospio benedicti japonica* Imajima, 1990
Nii-hamako, tidal flats – Masumoto *et al.*, 2007a.

Scalibregmatidae

- Scalibregma inflatum* Rathke, 1843
Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Sternaspidae

- Sternaspis scutata* (Ranzani, 1807)
Katsuura, shallow water – uncatalogued, June 1995.

Syllidae

- Alcyonosyllis exiliformis* (Imajima, 2003)
Ubara, Katsuura, rocky shore – Aguado *et al.*, 2008.
- Amblyosyllis speciosa* Izuka, 1912
Kominato, shallow water – Uchida and Hirano, 1996.
Boso Peninsula, intertidal to shallow water – Uchida, 2000.
- Ubara, Katsuura, rocky shore – Aguado *et al.*, 2008.
- Branchiosyllis exilis* (Gravier, 1900)
Ubara, Katsuura, rocky shore – Aguado *et al.*, 2008.
- Eusyllis assimilis* Marenzeller, 1875
Ubara, Katsuura, rocky shore – Aguado *et al.*, 2008.
- Eusyllis lamelligera* Marion and Bobretzky, 1875
Ubara, Katsuura, rocky shore – Aguado *et al.*, 2008.
- Haplosyllis spongicola* (Grube, 1855)
Kominato, intertidal rocky shore – Uchida and Hirano, 1996.
- Haplosyllis crassiccirrata* Aguado, San-Martin and Nishi, 2006.
Katsuura, intetidal rocky shore – Aguado *et al.*, 2006.
- Langerhansia cornuta* (Rathke, 1843)
Kominato, intertidal rocky shore – Uchida and Hirano, 1996.
- Nudisyllis tinihekea* Knox and Cameron, 1970
Ubara, Katsuura – Aguado *et al.*, 2008.
- Odontosyllis fulgurans* (Audouin and Milne Edward, 1833)
Ubara, Katsuura – Aguado *et al.*, 2008.
- Odontosyllis undecimdongta* Imajima and Hartman, 1964
Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.
- Kominato, intertidal rocky shore – Uchida and

- Hirano, 1996.
 Boso Peninsula, intertidal to subtidal – Uchida, 2000.
 Ubara, Katsuura – Aguado *et al.*, 2008.
Opisthosyllis brunnea sensu Imajima, 1966
 Kominato, intertidal rocky shore – Uchida and Hirano, 1996.
Opisthosyllis japonica Imajima, 1966
 Kominato, intertidal rocky shore – Uchida and Hirano, 1996.
Syllis amica Quatrefages, 1865
 Kominato, intertidal rocky shore – Uchida and Hirano, 1996.
 Boso Peninsula, intertidal rocky shore – Uchida, 2000.
Trypanedenta taeniaformis (Haswell, 1886)
 Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.
 Kominato, intertidal rocky shore – Uchida and Hirano, 1996.
 Boso Peninsula, intertidal to shallow water – Uchida, 2000.
Typosyllis armillaris (Muller, 1771)
 Kominato, intertidal rocky shore – Uchida and Hirano, 1996.
Typosyllis ehlersioidea Marenzeller, 1890
 Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.
Typosyllis fasciata (Malmgren, 1867)
 Katsuura, intertidal to subtidal – Chiba Prefecture, 1995.

Terebellidae

- Eupolymnia congruens* (Marenzeller, 1884)
 Kominato, shallow water – Uchida and Hirano, 1996.
Lysilla pacifica Hesse, 1917
 Boso Peninsula, intertidal to subtidal, sandy muddy bottom – Uchida, 2000.
Neoleprea japonica Hesse, 1917
 Yokosuka Channel – Hesse, 1917.
Nicolea venustula (Montagu, 1818)
 Kominato, intertidal rocky shore – Uchida and Hirano, 1996.
Phisidia samica Hesse, 1917
 Yokosuka Channel – Hesse, 1917, Imajima and Hartman, 1964.
Pista elongata Moore, 1909
 Boso Peninsula, intertidal to subtidal – Uchida, 2000.
Polycirrus nervosus Marenzeller, 1884
 Yokosuka Channel – Imajima and Hartman, 1964.
Terebella ehrenbergi Grube, 1870

- Yokosuka Channel - Imajima and Hartman, 1964.
Terebella punctata Hesse, 1917
 Kominato, intertidal rocky shore – Uchida and Hirano, 1996.
Thelepus setosus (Quatrefages, 1865)
 Kominato, intertidal rocky shore – Uchida and Hirano, 1996.
 Boso Peninsula, intertidal to subtidal – Uchida, 2000.
Thelepus japonicus Marenzeller, 1884
 Kominato, intertidal rocky shore – Uchida and Hirano, 1996.
 Boso Peninsula, intertidal to subtidal – Uchida, 2000.

Typhloscolecidae

- Sagitella kowalewskii* Wagner, 1872
 Tateyama – Imajima and Hartman, 1964.

Discussion

Polychaetes recorded from the coastal habitats off the Boso Peninsula with published records and unpublished data catalogued museum specimens raise the known number of species to 166. However, species richness in many intertidal to shallow waters of inner side of the Tokyo Bay is still underestimated because new species are being described (Nishi, in prep.) and many sites have not been studied. Nishi *et al.* (2009a) showed that approximately 100 polychaete species were found only in the area near the mouth of Tamagawa River within the near shore waters off Haneda Airport. Further collecting and taxonomic studies would likely add more species to presently under-represented families, such as Polynoidae, Sabellidae, Terebellidae, Cirratulidae, and Phyllodocidae. The families with large number of species recorded from the Boso Peninsula coastal waters are Spionidae (19 species), Nereididae (17 species), Syllidae (17 species), and Terebellidae (11 species). These families are usually well represented in the benthos, often with high species abundance (Masumoto *et al.*, 2007a, b, Nishi *et al.*, 2009a). In addition to these taxa, Cirratulidae, Maldanidae and Lumbrineridae are also frequently found in great numbers in the benthos around Boso Peninsula, although representatives of these families are difficult to identify correctly to the species level.

Among the above 167 species recorded from the Boso Peninsula waters, a number of species are listed as indicators of environmental disturbance or pollution indicators in environmental assessment studies

(e.g., Henriksson, 1969, Masumoto *et al.*, 2007a, b). Those are *Neanthes succenea*, *Capitella capitata*-species complex, *Sigambra hanaokai*, *Paraprionospio patiens*, *Paraprionospio coora*, *Scoletoma nipponica*, *Lumbrineris longifolia*, *Spiochaetopterus okudai*, and *Cirriformia comosa*. Additionally, *Polydora cornuta* and *Streblospio benedicti* are commonly used as pollution indicators in some tidal flats of Tokyo Bay, such as Sanbanse and Nii-hamako, where these species are common and even dominate benthic communities (Masumoto *et al.*, 2007a, b). In fact, the polluted status of some estuarine tidal flats and shallow waters of Tokyo Bay has been established from the occurrence of these species (Furota and Sato-Okoshi, 1997). The questionable taxonomic status of indicator species, such as “cosmopolitan “world-wide common species” or sibling species of *Capitella capitata*, *Streblospio benedicti*, *Polydora cornuta*, etc., needs to be cleared in taxonomic studies, which may lead to positive identifications by para-taxonomists and environmental assessment workers.

Estuarine brackish-water habitats of the Boso Peninsula area, such as Isumigawa River estuary, Obitsugawa River estuary and brackish-water Nii-hamako Lake harbour obligate brackish-water species *Tylorrhynchus heterochaetus*, *Hediste diadroma*, *H. atoka*, *Prionospio japonica*, and *Streblospio benedicti japonica*. These taxa should be now considered as threatened species because estuarine waters are mostly reclaimed in the Tokyo Bay.

Among the above mentioned species in the list, there are several recently introduced species. Some of them, such as *Hydroides elegans*, *H. ezoensis*, *H. dianthus* (see Link *et al.*, 2009), *Ficopomatus enigmaticus*, *Neanthes succenea*, and *Harmothoe cf. imbricata*, have been collected from the fouling communities of floating buoys and other man-made structures (Nishi and Kato, 2004; Nishi and Tanaka, 2005; Nishi, 2003). Taxonomy of such introduced species should be further studied with special care to determine whether their current names are valid. For example, the polynoid genus *Harmothoe* and phyllodocid genus *Eulalia* are likely to contain numerous undescribed species, so before the decision is made whether the representatives of these genera alien or native, the new species should be properly described and correct specific names of existing species should be determined. Introduced species often become pests on commercial mariculture species and cause serious damage to fisheries and

marine environments (Nishi and Tanaka, 2009), therefore, they should be carefully monitored in coastal areas of the Tokyo Bay.

Our studies of the polychaete fauna of the Boso Peninsula and the adjacent areas, including the waters from Tokyo Bay to Sagami Bay, are still in progress with ongoing efforts devoted to molecular barcoding (Kupriyanova and Nishi, in prep), and to taxonomic revision of certain Japanese taxa (e.g., Böggemann, 2002). This study is a first step towards an eventually complete comprehensive species list and further summary of ecological, systematic, and phylogenetic information.

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- Tateyama, Boso Peninsula, sandy mud bottom.
Holotype – CMNH- ZW 101.
Paratypes – CMNH-ZW 102–108.
- Mesochaetopterus formosana* Nishi and Hsieh, 2009
Taiwan, estuarine tidal flats.
Paratypes – CMNH-ZW 1694, CBM-ZW 1008.
- Phyllochaetopterus awasensis* Nishi and Hsieh, 2009
Awase tidal flat, Okinawa.
Holotype – CMNH-ZW 1799.
- Phyllochaetopterus lauensis* Nishi and Rouse, 2007
Lau back-arc Basin, near Tonga, deep sea.
Paratype – CBM-ZW 1006.
- Phyllochaetopterus polus* Morineaux, Nishi, Ormos and Mouchel, 2010
Mid-Atlantic Ridge, Ashadze-I vent field.
Paratypes – CBM-ZW 1020–1022.
- Spiochaetopterus iheyaensis* Nishi, 2008
Off Iheya Ridge, East China Sea.
Holotype – CMNH-ZW 1699
- Spiochaetopterus sagamiensis* Nishi, Miura and Bhaud, 1999
Off Hatsushima, Sagami Bay.
Holotype – CBM-ZW 701.
Paratype – CBM-ZW 702.
- Spiochaetopterus sanbanzensis* Nishi, Bhaud and Koh, 2004
Sanbanse, tidal flat.
Holotype – CBM-ZW 263.
Paratypes – CBM-ZW 313–316, CMNH- ZW 1531–1533.
- Spiochaetopterus izuensis* Nishi, Bhaud and Koh, 2004
Futo, Izu Peninsula, shallow water.
Holotype – CBM-ZW 317.
Paratypes – CBM-ZW 318–321.
- Spiochaetopterus okinawaensis* Nishi and Bhaud, 2000
Okinawajima-Island, shallow sandy shore.
Holotype – CBM-ZW 302.
Paratypes – CBM-ZW 303–311.
- Spiochaetopterus sesokoensis* Nishi and Bhaud, 2000
Sesoko Island, Okinawa, shallow sandy shore.
Holotype – CBM-ZW 70.
Paratype – CBM-ZW 700.

Appendix

Catalogue of the polychaete type specimens deposited in Natural History Museum and Institute, Chiba (CBM) and Coastal Branch of Natural History Museum and Institute, Chiba (CMNH)

Chaetopteridae

- Chaetopterus pacificus* Nishi, 2001
Futo, Izu peninsula, shallow water.
Holotype – CBM-ZW 323.
Paratypes – CBM- ZW 325, 362, 363.
- Chaetopterus gregarious* Nishi, Arai and Sasanuma, 2000
Uchibo, Tokyo Bay, 120–300 m deep.
Holotype – CMNH-ZW 32.
Paratypes – CMNH-ZW 33–41.
- Chaetopterus izuensis* Nishi, 2001
Futo, Izu Peninsula, shallow water.
Holotype – CBM- ZW 356.
Paratype – CBM- ZW 357.
- Chaetopterus japonicus* Nishi, 2001

Eulepethidae

- Grubeulepis malayensis* Nishi, 2001
Morib Beach, Malaysia.
Holotype – CMNH-ZW 248.

Lumbrineridae

Lumbrineris higuchiae Carrera-Parra, 2006
Shimoda, Japan.

Holotype – CBM-ZW 961.

Paratype – CBM-ZW 962.

Lumbrineris imajimai Carrera-Parra, 2006
Shimoda, Japan.

Holotype – CBM-ZW 971.

Paratype – CBM-ZW 972.

Lumbrineris nishii Carrera-Parra, 2006
Shimoda, Japan.

Holotype – CBM-ZW 973.

Paratype – CBM-ZW 974.

Nereididae

Hediste atoka Sato and Nakashima, 2003
Aomori, Japan.

Paratypes – CMNH-ZW 1889, 1890.

Hediste diadroma Sato and Nakashima, 2003
Kagoshima, Japan.

Paratype – CMNH-ZW 1891.

Onuphidae

Longibrachium arariensis Nishi and Kato, 2009
Koganezaki beach, Izu Peninsula, Japan.
Holotype – CMNH-ZW01695.

Ophelidae

Euzonus japonicus Misaka and Sato, 2003
Shimoda, shallow water.
Paratype – CMNH-ZW 1939.

Phyllodocidae

Paranaites misakiensis Kato and Pleijel, 2003
Odawa, Sagami Bay, shallow water.
Paratype – CMNH-ZW 1440.

Polynoidae

Hololepidella boninensis Nishi and Tachikawa, 1998
Chichi-jima, Ogasawara Islands, subtidal coral reef.
Holotype – CBM-ZW 463.

Lepidastheniella nishii Barnich and Fiege, 2004
Shimoda, shallow water.
Holotype – CMNH-ZW 1400.

Sabellariidae

Idanthyrus boninensis Nishi and Kirtley, 1999
Ogasawara Islands, intertidal rocky shore.
Holotype – CBM-ZW 40.
Paratypes – CBM-ZW 114, 115, 681–692.

Idanthyrus okinawaensis Nishi and Kirtley, 1999
Zampa Cape, Okinawajima-Island, shallow water.
Holotype – CBM-ZW 48.
Paratype – CBM-ZW 137.

Lygdamis japonicus Nishi and Kirtley, 1999
Yatsushiro-kai, Kyushu.
Holotype – CBM-ZW 389.
Paratypes – CBM-ZW 688, 268, 270, 689.

Lygdamis wirtzi Nishi and Nunez, 1999.
Madeira Island, Portugal, and Canary Islands, Spain.
Holotype – CMNH-ZW 50.
Paratypes – CMNH-ZW 51, 52.

Neosabellaria vitiensis Bailey-Brock, Kirtley, Nishi and Pohler, 2007
Suva Harbour, Fiji.

Paratypes – CBM-ZW 976, CMNH-ZW 1659–1664.

Sabellaria isumiensis Nishi, Bailey-Brock, dos Santos and Kupriyanova, 2010
Onjuku, Isumi, Boso Peninsula, subtidal rocky shore.
Holotype – CMNH-ZW 01630.
Paratypes – CBM-ZW 1026, 1027, CMNH-ZW 01629.

Sabellidae

Megalomma miyukiae Nishi, 1998
Phuket, subtidal coral reef.
Holotype – CBM-ZW 106.
Paratypes – CBM-ZW 104, 105.

Paradialychone edomae Nishi, Tanaka, Tovar-Hernandez and Giangrande, 2009
Haneda, Tokyo Bay.
Holotype – CBM-ZW 1011, 1012, 1013,
Paratypes – CMNH-ZW 1687, 1688.

Paradialychone katsuuraensis Nishi, Tanaka, Tovar-Hernandez and Giangrande, 2009
Katsuura, subtidal sea-grass beds, Boso Peninsula, Japan.
Holotype – CBM-ZW 557.
Paratypes – CBM-ZW 552, 554, 555, 561.

Dialychone okudai Nishi, Tanaka, Tovar-Hernandez and Giangrande, 2009
Aikap, Akkeshi, Hokkaido, subtidal muddy bottom, Japan.
Holotype – CBM-ZW 1014.

Jasmineira kikuchii Nishi, Tanaka, Tovar-Hernandez and Giangrande, 2009.
Ariake Sound, Kyushu, Japan.
Holotype – CBM-ZW 1015,
Paratypes – CBM-ZW 1016, 1017.

Serpulidae

Metavermlia ogasawaraensis Nishi, Kupriyanova and Tachikawa, 2007

Ogasawara, Pacific Ocean.

Holotype – CMNH-ZW 1700.

Pseudochitinopoma pavimentata Nishi, 1999

Off Tateyama, Tokyo Bay.

Holotype – CBM-ZW 50.

Paratypes – CBM-ZW 51, 52.

Spionidae

Polydora aura Sato-Okoshi, 1998

Tateyama, Boso Peninsula.

Holotype – CBM-ZW 903.

Paratypes – CBM-ZW 904, 905.

Polydora uncinata Sato-Okoshi, 1998.

Iwate, Japan.

Holotype – CBM-ZW 901.

Paratypes – CBM-ZW 902.

Carazziella spongilla Sato-Okoshi, 1998

Lake Shinji, Shimane, Japan.

Holotype – CBM-ZW 906.

Paratypes – CBM-ZW 907.

Syllidae

Alcyonosyllis glasbyi San-Martin and Nishi, 2003.

Shimoda, Izu Peninsula.

Holotype – CMNH- ZW 1399.

Paratypes – CMNH-ZW 1461, 1462.

Terebellidae

Pista shizugawaensis Nishi and Tanaka, 2006

Shizugawa, Sanriku coasts, shallow water.

Holotype – CMNH-ZW 1800.

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房総半島沿岸に産する環形動物多毛類相と千葉県立博物館に保管されているタイプ標本リスト

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房総半島沿岸に産する環形動物多毛類相を調査した。これまで 37 科 160 種が記録されており、今回、千葉県立博物館に保管されている標本も調査し、房総半島沿岸新記録種もえられた。沿岸の干潟域から 50 種、汽水域から 12 種、岩礁域から 60 種以上、東京湾内の刺網サンプルから約 30 種が記録された。それらの中には、有機汚濁指標種とされる 9 種、外来種と考えられる 7 種、希少種と考えられる 3 種が含まれていた。これらの記録や標本を基に、房総半島沿岸の多毛類相と多様性を考察した。また、千葉県立中央博物館と千葉県立中央博物館分館海の博物館にあるタイプ標本のリストも示した。